ECONOMIC ANALYSIS OF THE FOMES ANNOSUS HAZARD TREE REMOVAL PROGRAM IN YOSEMITE NATIONAL PARK

Report No. 83-10

FOREST PEST MANAGEMENT USDA FOREST SERVICE
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ABSTRACT

This report presents the results of an analysis of the Hazard Tree Removal Program in Yosemite National Park. Guidelines for the program were developed through a cooperative project involving the University of California, the National Park Service, and the USDA Forest Service. The guidelines, presented as management options, were identified in a Forest Pest Management Staff biological evaluation report of the Fomes annosus problem in the developed recreation sites of Yosemite Valley.

This analysis is based on two types of economic valuation: the present net value (PNV) and the benefit/cost ratio. Present net value is a measure of the current economic value of the resources that could be saved as a result of implementing management options. The benefit/cost analysis identifies the social costs and benefits of investment projects to help determine whether or not they should be undertaken from the standpoint of economic benefit.

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INTRODUCTION

The purpose of this analysis is to elucidate the economic effects of treatments undertaken to reduce the negative impacts of tree failure in developed recreation sites in Yosemite National Park.

HISTORICAL BACKGROUND

During the late 1960's a hazard tree removal program was initiated in Yosemite National Park. The purpose of this program was to remove killed trees from developed recreation sites in Yosemite Valley.

In 1971 Forest Pest Management (FPM) began a six-year biological evaluation of the causes of tree mortality in the developed recreation sites within Yosemite National Park. This biological evaluation culminated in a draft report, including detailed maps of the occurrence of tree mortality, which was given to personnel of Yosemite National Park in 1976. A final report was issued in 1978 (1).[1/] The Park Service modified their hazard tree removal program to incorporate all the recommendations of the report.

The situation statement and recommendations from this report are as follows:

SITUATION STATEMENT

"F. annosus root disease, active in over 100 mortality centers, is widely distributed in the developed recreation sites of Yosemite Valley. To date approximately 1,400 trees have died in these centers and 1,200 more are expected to die within the next ten years. The problem already severely affecting many recreation sites is expected to worsen as the existing centers enlarge and as new centers are found.

"The data indicate that most conifers in developed sites will ultimately be lost directly or indirectly to annosus root disease, perhaps in as little as 30 to 40 years. This will result in the loss of the forest cover or at best a cover of sparsely scattered hardwoods. The camping experience will decline as the forest cover is lost, and the area suitable for camping will decrease as the campgrounds are denuded.

"The probability of tree failure and hazard has increased in and around the mortality centers in developed sites. This is the result of root and butt decay and opening of the stand to windthrow. This hazard problem is expected to increase as the affected area and number of trees increases."

1/ Numbers in parentheses refer to citations listed on page 23.

RECOMMENDATIONS

The control options that were identified were limited in number and are either preventative or indirect in nature. Some methods of hazard reduction were also needed. The available controls were as follows.

"Prevention. Prevention of center initiation is highly desirable. Since infection centers are known to start with the infection of freshly-cut conifer stumps and borax treatment of the stump surfaces will prevent infection from occurring, it is recommended that all freshly-cut conifer stump surfaces be treated with dry powdered borax as indicated on the pesticide labeling. Circumstantial evidence indicates that some centers originate at suppressed trees. For this reason uprooting and removal of suppressed trees might reduce center initiation. The removal of suppressed trees would also increase the resistance of the stand to bark beetle attack.

"Indirect Control. All direct control procedures for annosus root disease are costly and should be considered experimental; therefore, the only options are indirect methods of avoiding, alleviating, learning to live with, or ignoring the problem. The data indicate preservation of present stands and stand type in many areas of the Valley is not possible and that there will be a gradual conversion to a meadow, open woodlands type of cover."

"Hazard Control. Because of the large increase in tree failure and hazard resulting from annosus root disease, hazard control must be a major concern in managing the affected recreation site. There are two basic approaches to hazard control or reduction: (1) to remove the target of the hazardous trees, or (2) to remove the hazardous trees.

"The first option of removing the target by closing a portion or all of a recreation site would be most appealing for those sites with small capital investments and with large or numerous root disease centers and many hazardous trees. In such areas control by hazard tree removal may so denude the areas that their appeal as a recreation site is lost.

"In those areas where recreation use will continue, the prompt removal of all identifiable hazardous trees is essential. Removal of declining trees will reduce the hazard from uprooting and will also increase stand resistance to beetle attack . . . . The removal of declining trees to reduce hazard from uprooting will further open the stand and increase the probability of failure by stem breakage or windthrow, but at this time there does not appear to be any feasible method of reducing these types of failure resulting from high winds and stand openings.

"The effects of this root disease on the developed sites in Yosemite Valley are so severe that they must be considered in the development of future plans for the Valley. These plans must be realistically based on future projections and on available options for disease and hazard control. After the management objectives and plans have been determined, the particular control option(s) can be chosen.".

LISTING OF BENEFITS AND COSTS

BENEFITS

1. Recreation enhancement.
2. Reduced damage awards
3. Reduction in hazard tree removal costs
4. Tree salvage (1979-1980)
5. Reduced clean-up costs

COSTS

1. FPM evaluation
2. Tree salvage sale
   a) Preparation
   b) Administration
3. Hazard tree removal
4. Cleanup
5. Program administration - annual [1/]

CALCULATIONS

Tables 1 through 3 in Appendix A (pp. 8-10) display the economic analysis of this hazard tree removal program for Yosemite Valley. The program is expected to last 40 years, from 1979 to 2019. Therefore, the analysis is for that period.

Table 1 lists by year the basic calculations for the benefits and costs for the program phases.

Table 2 lists by year the benefits and then the costs of the program phases, plus the total benefits and total costs of the program.

1/ The program administration costs are included with the hazard tree removal costs in the calculations for this economic analysis.

Table 3 lists by year for the total project the total benefits, total costs, net value, present net value, the summation of the present net value by year, and gives the present values and benefit/cost ratio for the total program.

The rationale and calculations which serve as the basis for these table values are in Appendix B (p. 11 ff).

RESULTS

The present net value and benefit/cost ratio for this program are:

Present Net Value = $4,076,600 B/C Ratio = 52.54

This economic analysis indicates this is a very advantageous program to undertake because the social benefits of the program greatly exceed the costs of carrying it out.

ECONOMIC WORTH OF FPM'S WORK

Richard Riegelhuth and Lorne West of the Resource Management Staff, Yosemite National Park, state that the value of Forest Pest Management work is:

1. The accomplishment of the biological evaluation, which establishes the importance of Fomes annosus to hazard tree failures within the developed recreation sites of the park, the impact and the probable future development of this disease-inducing organism upon these sites in the future.

2. The mapping of its occurrence in the developed recreation sites.

3. Developing guidelines for detecting indications of early failure of root-diseased trees.

4. The development of alternatives for treating this root disease condition.

They also state that this information is valuable in supplementing the Park's on-going tree hazard removal program.

The present net value of the benefits derived from the work financed and performed by FPM is estimated to be at least 75% of the present net value of the total program, because without this technical assistance most of the benefits gained by this program would not be attained. Therefore, the present net value of FPM's biological evaluation and related work with this particular pest management problem in Yosemite National Park, as projected over the 40-year life of the program, is $3,057,450, with a benefit/cost ratio of 69.99.

CONCLUSIONS

It is advantageous to implement all phases of this Fomes annosus hazard tree removal program, because all the social-economic criteria of this analysis are positive.

The program phase which provides the greatest returns is the reduction in expected damage awards. This hazard tree removal program will help to keep these costs minimal by helping reduce the total number of such accidents caused by tree failures, and by demonstrating that the National Park Service is actively trying to reduce the potential for hazard tree failures which could cause injury or death to people or damage to property.

The value of Forest Pest Management work in this program is $3,057,450 over the 40-year life of the program, with a benefit/cost ratio of 69.99.

APPENDIX A

(Tables)

TABLE	TITLE
1	Calculations for Benefit-Cost Time Stream
2	Benefit-Cost Time Stream
3	Cash Flow Time Stream

TABLE 1 CALCULATIONS FOR BENEFIT-COST TIME STREAM

YEAR	RECREATION SATISFACTION INDEX WITH TREATMENT	RECREATION SATISFACTION INDEX WITHOUT TREATMENT	RECREATION SATISFACTION INDEX DIFFERENCE WITH-WITHOUT	CHANGE IN RECREATION VALUE DOLLARS PER YEAR	EXPECTED ANNUAL DAMAGE AWARDS WITH TREATMENT	EXPECTED ANNUAL DAMAGE AWARDS WITHOUT TREATMENT	REDUCTION IN EXPECTED DAMAGE AWARDS	CLEANUP WITH	CLEANUP WITHOUT	REDUCTION IN CLEAN UP COSTS	HAZARD TREE REMOVAL WITH	HAZARD TREE REMOVAL WITHOUT	REDUCTION IN HAZARD TREE REMOVAL COSTS
1	1.0	0.8	0.2	560,000	1,380	241,852	240,472	720	2,138	1,418	135,000	180,000	45,000
2	1.0	0.8	0.2	560,000	1,380	241,852	240,472	720	2,138	1,418	135,000	180,000	45,000
3	1.0	0.9	0.1	280,000	1,380	241,852	240,472	720	2,138	1,418	135,000	180,000	45,000
4	1.0	0.9	0.1	280,000	1,380	241,852	240,472	720	2,138	1,418	135,000	180,000	45,000
5	1.0	1.0	0.0	0	1,380	241,852	240,472	720	2,138	1,418	135,000	180,000	45,000
6	1.0	1.0	0.0	0	1,380	241,852	240,472	720	2,138	1,418	135,000	180,000	45,000
7	1.0	1.0	0.0	0	1,380	241,852	240,472	720	2,138	1,418	135,000	180,000	45,000
8	1.0	1.0	0.0	0	1,380	241,852	240,472	720	2,138	1,418	135,000	180,000	45,000
9	1.0	1.0	0.0	0	1,380	241,852	240,472	720	2,138	1,418	135,000	180,000	45,000
10	1.0	1.0	0.0	0	1,380	241,852	240,472	720	2,138	1,418	135,000	180,000	45,000
11	1.0	1.0	0.0	0	1,380	241,852	240,472	720	2,138	1,418	117,000	180,000	63,000
12	1.0	1.0	0.0	0	1,380	241,852	240,472	720	2,138	1,418	117,000	180,000	63,000
13	1.0	1.0	0.0	0	1,380	241,852	240,472	720	2,138	1,418	117,000	180,000	63,000
14	1.0	1.0	0.0	0	1,380	241,852	240,472	720	2,138	1,418	117,000	180,000	63,000
15	1.0	1.0	0.0	0	1,380	241,852	240,472	720	2,138	1,418	117,000	180,000	63,000
16	1.0	1.0	0.0	0	1,380	241,852	240,472	720	2,138	1,418	117,000	180,000	63,000
17	1.0	1.0	0.0	0	1,380	241,852	240,472	720	2,138	1,418	117,000	180,000	63,000
18	1.0	1.0	0.0	0	1,380	241,852	240,472	720	2,138	1,418	117,000	180,000	63,000
19	1.0	1.0	0.0	0	1,380	241,852	240,472	720	2,138	1,418	117,000	180,000	63,000
20	1.0	1.0	0.0	0	1,380	241,852	240,472	720	2,138	1,418	117,000	180,000	63,000
21	1.0	1.0	0.0	0	690	120,902	120,212	360	1,070	710	99,000	180,000	81,000
22	1.0	1.0	0.0	0	690	120,902	120,212	360	1,070	710	99,000	180,000	81,000
23	1.0	1.0	0.0	0	690	120,902	120,212	360	1,070	710	99,000	180,000	81,000
24	1.0	1.0	0.0	0	690	120,902	120,212	360	1,070	710	99,000	180,000	81,000
25	1.0	1.0	0.0	0	690	120,902	120,212	360	1,070	710	99,000	180,000	81,000
26	1.0	1.0	0.0	0	690	120,902	120,212	360	1,070	710	99,000	180,000	81,000
27	1.0	1.0	0.0	0	690	120,902	120,212	360	1,070	710	99,000	180,000	81,000
28	1.0	1.0	0.0	0	690	120,902	120,212	360	1,070	710	99,000	180,000	81,000
29	1.0	1.0	0.0	0	690	120,902	120,212	360	1,070	710	99,000	180,000	81,000
30	1.0	1.0	0.0	0	690	120,902	120,212	360	1,070	710	99,000	180,000	81,000
31	1.0	1.0	0.0	0	345	64,414	64,069	180	540	360	90,000	180,000	90,000
32	1.0	1.0	0.0	0	345	64,414	64,069	180	540	360	90,000	180,000	90,000
33	1.0	1.0	0.0	0	345	64,414	64,069	180	540	360	90,000	180,000	90,000
34	1.0	1.0	0.0	0	345	64,414	64,069	180	540	360	90,000	180,000	90,000
35	1.0	1.0	0.0	0	345	64,414	64,069	180	540	360	90,000	180,000	90,000
36	1.0	1.0	0.0	0	345	64,414	64,069	180	540	360	90,000	180,000	90,000
37	1.0	1.0	0.0	0	345	64,414	64,069	180	540	360	90,000	180,000	90,000
38	1.0	1.0	0.0	0	345	64,414	64,069	180	540	360	90,000	180,000	90,000
39	1.0	1.0	0.0	0	345	64,414	64,069	180	540	360	90,000	180,000	90,000
40	1.0	1.0	0.0	0	345	64,414	64,069	180	540	360	90,000	180,000	90,000

TABLE 2 BENEFIT - COST TIME STREAM (HORIZONTAL)

YEAR	RECREATION ENHANCEMENT	REDUCED DAMAGE AWARDS	TIMBER SALVAGE	REDUCED CLEANUP COSTS	REDUCED HAZARD CONTROL	TOTAL BENEFITS	COSTS FPM EVALUATION	COSTS SALE ADMIN.	COSTS SALE PREP	TOTAL COSTS
pp 1/	0	0	0	0	0	0	42,300	0	0	42,300
1	560,000	240,500	52,000	1,400	45,000	898,900	1,000	8,000	9,000	18,000
2	560,000	240,500	13,000	1,400	45,000	859,900	0	8,000	16,000	24,000
3	280,000	240,500	0	1,400	45,000	566,900	0	0	0	0
4	280,000	240,500	0	1,400	45,000	566,900	0	0	0	0
5	0	240,500	0	1,400	45,000	286,900	0	0	0	0
6	0	240,500	0	1,400	45,000	286,900	0	0	0	0
7	0	240,500	0	1,400	45,000	286,900	0	0	0	0
8	0	240,500	0	1,400	45,000	286,900	0	0	0	0
9	0	240,500	0	1,400	45,000	286,900	0	0	0	0
10	0	240,500	0	1,400	45,000	286,900	1,000	0	0	1,000
11	0	240,500	0	1,400	63,000	304,900	0	0	0	0
12	0	240,500	0	1,400	63,000	304,900	0	0	0	0
13	0	240,500	0	1,400	63,000	304,900	0	0	0	0
14	0	240,500	0	1,400	63,000	304,900	0	0	0	0
15	0	240,500	0	1,400	63,000	304,900	0	0	0	0
16	0	240,500	0	1,400	63,000	304,900	0	0	0	0
17	0	240,500	0	1,400	63,000	304,900	0	0	0	0
18	0	240,500	0	1,400	63,000	304,900	0	0	0	0
19	0	240,500	0	1,400	63,000	304,900	0	0	0	0
20	0	240,500	0	1,400	63,000	304,900	1,000	0	0	1,000
21	0	120,200	0	700	81,000	201,900	0	0	0	0
22	0	120,200	0	700	81,000	201,900	0	0	0	0
23	0	120,200	0	700	81,000	201,900	0	0	0	0
24	0	120,200	0	700	81,000	201,900	0	0	0	0
25	0	120,200	0	700	81,000	201,900	0	0	0	0
26	0	120,200	0	700	81,000	201,900	0	0	0	0
27	0	120,200	0	700	81,000	201,900	0	0	0	0
28	0	120,200	0	700	81,000	201,900	0	0	0	0
29	0	120,200	0	700	81,000	201,900	0	0	0	0
30	0	120,200	0	700	81,000	201,900	1,000	0	0	1,000
31	0	64,000	0	360	90,000	154,360	0	0	0	0
32	0	64,000	0	360	90,000	154,360	0	0	0	0
33	0	64,000	0	360	90,000	154,360	0	0	0	0
34	0	64,000	0	360	90,000	154,360	0	0	0	0
35	0	64,000	0	360	90,000	154,360	0	0	0	0
36	0	64,000	0	360	90,000	154,360	0	0	0	0
37	0	64,000	0	360	90,000	154,360	0	0	0	0
38	0	64,000	0	360	90,000	154,360	0	0	0	0
39	0	64,000	0	360	90,000	154,360	0	0	0	0
40	0	64,000	0	360	90,000	154,360	1,000	0	0	1,000

1/ Year pp is the planning period for the project (1973-1978).

TABLE 3. FOMES ANNOSUS CONTROL PROGRAM
IN YOSEMITE NATIONAL PARK
CASH FLOW TIME STREAM

YEAR	TOTAL BENEFITS	TOTAL COSTS	NET VALUE	PRESENT NET VALUE	SUMMATION PRESENT NET VALUE
pp[1/]	0	42,300	-42,300	-42,300	-42,300
1	898,900	18,000	880,900	800,700	758,400
2	859,900	24,000	835,900	690,500	1,448,900
3	566,900	0	566,900	425,700	1,874,600
4	566,900	0	566,900	387,200	2,261,800
5	286,900	0	286,900	178,200	2,440,000
6	286,900	0	286,900	161,800	2,601,800
7	286,900	0	286,900	147,200	2,749,000
8	286,900	0	286,900	133,700	2,882,700
9	286,900	0	286,900	121,600	3,004,300
10	286,900	1,000	285,900	110,400	3,114,700
11	304,900	0	304,900	106,700	3,221,400
12	304,900	0	304,900	97,300	3,318,700
13	304,900	0	304,900	88,400	3,407,100
14	304,900	0	304,900	80,200	3,487,300
15	304,900	0	304,900	72,900	3,560,200
16	304,900	0	304,900	66,500	3,626,700
17	304,900	0	304,900	60,400	3,687,100
18	304,900	0	304,900	54,900	3,742,000
19	304,900	0	304,900	50,000	3,792,000
20	304,900	1,000	303,900	45,300	3,837,300
21	201,900	0	201,900	27,300	3,864,600
22	201,900	0	201,900	24,800	3,889,400
23	201,900	0	201,900	22,600	3,912,000
24	201,900	0	201,900	20,600	3,932,600
25	201,900	0	201,900	18,600	3,951,200
26	201,900	0	201,900	17,000	3,968,200
27	201,900	0	201,900	15,400	3,983,600
28	201,900	0	201,900	14,000	3,997,600
29	201,900	0	201,900	12,700	4,010,300
30	201,900	1,000	200,900	11,500	4,021,800
31	154,360	0	154,360	8,100	4,029,900
32	154,360	0	154,360	7,400	4,037,300
33	154,360	0	154,360	6,700	4,044,000
34	154,360	0	154,360	6,000	4,050,000
35	154,360	0	154,360	5,500	4,055,500
36	154,360	0	154,360	5,100	4,060,600
37	154,360	0	154,360	4,600	4,065,200
38	154,360	0	154,360	4,200	4,069,400
39	154,360	0	154,360	3,800	4,073,200
40	154,360	1,000	153,360	3,400	4,076,600

Present Value Benefits = $4,155,700 Present Value Costs = $79,100
Present Net Value = $4,076,600 B/C Ratio = 52.54

1/ Year pp is the planning period for the project (1973-1978).

APPENDIX B

(Rationale and Calculations)

EVALUATION OF RECREATION USE

Assumptions[1/]

People at one time (PAOT) is a measure of the capacity of a recreation area. The PAOT of the developed campsites at Yosemite Valley is 26,400 people.

Full-use days per year equals 30 days.

Average non-capacity days of use per year equals 145 days.

Average days of use per year equals 145 + 30 = 175 days.

Average use per non-capacity day equals 2,000 people.

Recreation visitor days (RVD) is a measure of the relative use of a recreation site. The average RVD per year for the developed recreation sites at Yosemite Valley is:

$$26{,}400 \times 30 + 2000 \times 145 = 1{,}082{,}000$$

The value of a recreation visitor day in Yosemite Valley is $8.00.

The annual RVD value is: $8.00 X 1,082,000 = $8,656,000.

1/ From file records of Lorne West, Forester, Yosemite National Park.

Recreation Satisfication Index

Figure 1 (next page) is a representation of the assumed relationship between recreation satisfication and stand density. Stand basal area is used to measure stand density.

Basic assumptions were developed to form the recreation satisfaction index to stand density. These assumptions were developed by Lorne West, Forester, Yosemite National Park; personnel of the Recreation Staff, Yosemite National Park; Michael Skinner, Land Management Staff, U.S. Forest Service, Region Five; and Robert Erwin, Area Planning and Development Staff, U.S. Forest Service, Region Five.

The basic assumptions for the recreation satisfaction index to stand density are:

a) People like to camp in grouped patterns, yet maintain a fair degree of privacy between these groups. The usual way to help supply this privacy is to have stands of trees provide a screening effect between the groups.

b) Trees are desired in campgrounds to provide:

Aesthetic satisfaction, shade, protection, screening, etc.

c) The degree of shade desired for a campsite is about 70 percent.

d) If stands are too dense, people cannot walk through them with ease; they thus become obstacles to recreational use. The lower limit for this effect was estimated to be a basal area of 240 square feet per acre: 80 per cent of normal basal area. This is also the stand density level where the stands become dense enough to be stressed and develop disease and insect conditions which will impact the stands.

e) When the stocking levels of stands are too sparse they do not provide the desired level of shade, aesthetics, or screening from other groups. The upper limit for this effect is estimated to be a basal area of 100 square feet per acre. This is about 20 trees per acre in the developed campsites of Yosemite Valley. This would be a spacing of about 47 feet between trees.

f) Although outdoor recreation sites which have no or few trees can be highly desirable to people, it is assumed that people go to Yosemite Valley to enjoy its trees, meadows and granite domes. Therefore, stands of trees would be an integral part of the type of experience they are seeking there.

[illegible] and density

[illegible] assumptions were developed [illegible] density. These [illegible] Osomesh National [illegible] Tennessee [illegible] National Forest [illegible] The Flora [illegible] Forest Service, Region Five.

[illegible] basic assumptions [illegible] are:

1) People like [illegible] supply [illegible] privacy [illegible] effect [illegible]

[illegible]

[illegible]

[illegible] stand [illegible] become obstacles [illegible] limits for this effect is estimated [illegible] 24 [illegible] feet per acre [illegible] per cent of [illegible] This [illegible] also the stand density level where [illegible] to be stressed and [illegible] disease [illegible] will impact the stands.

[illegible] When the stocking levels of stands are too sparse they do not provide the desired level of shade, aesthetics, or screening from other groups. The upper limit [illegible] effect [illegible] basal area of 100 square feet per acre. This is [illegible] per acre in the developed campsites [illegible] would be a spacing of about 47 feet between trees.

1) Although outdoor recreation sites which have no or few trees [illegible] be highly desirable to people, it is assumed that people go [illegible] service [illegible] to enjoy its trees, meadows and granitic domes. Therefore stands of trees would be an integral part of the type experience [illegible] are seeking there.

Figure #1

ERWIN - HART - SKINNER RECREATION SATISFACTION INDEX

Recreation Satisfaction Indexed To Stand Density

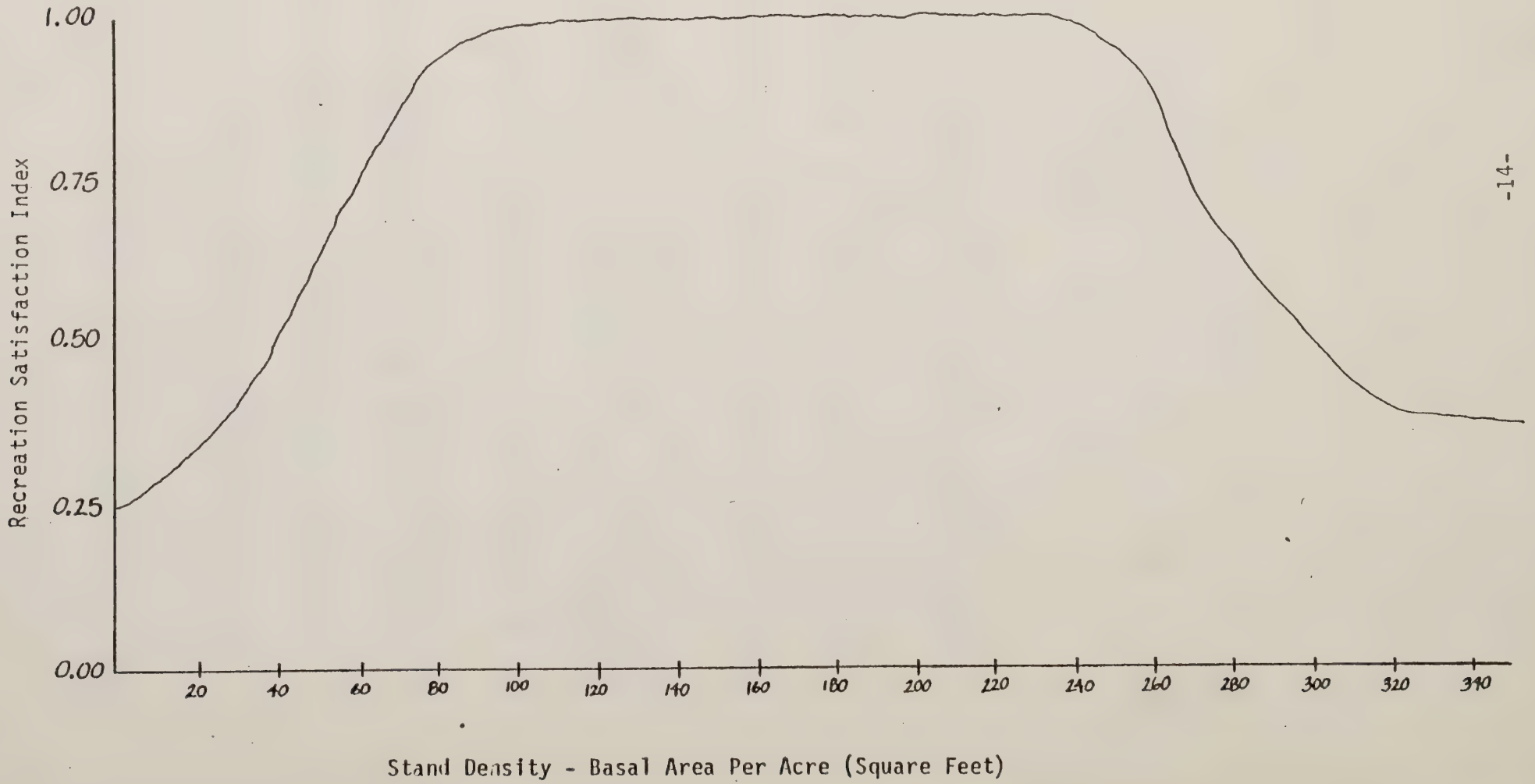


Figure 2 (next page) illustrates the relationship of stand basal area over time, in the developed campsites. The following assumptions are made:

a) Existing stands are overstocked (Citation 3).

b) Because the stands are overstocked, they are losing their natural vigor and becoming stressed (Citation 4).

c) As this stressed condition increases, trees will tend to be killed to reduce this level of stress (Citations 1 and 4).

d) Forest insects and diseases contribute significantly to causing the decline and death of trees in stressed stands. Fomes annosus and Dendroctonus bark beetles contribute significantly to this effect.

e) Drought will intensify the degree of stress in the stands, causing an increased rate of tree mortality (Citation 5).

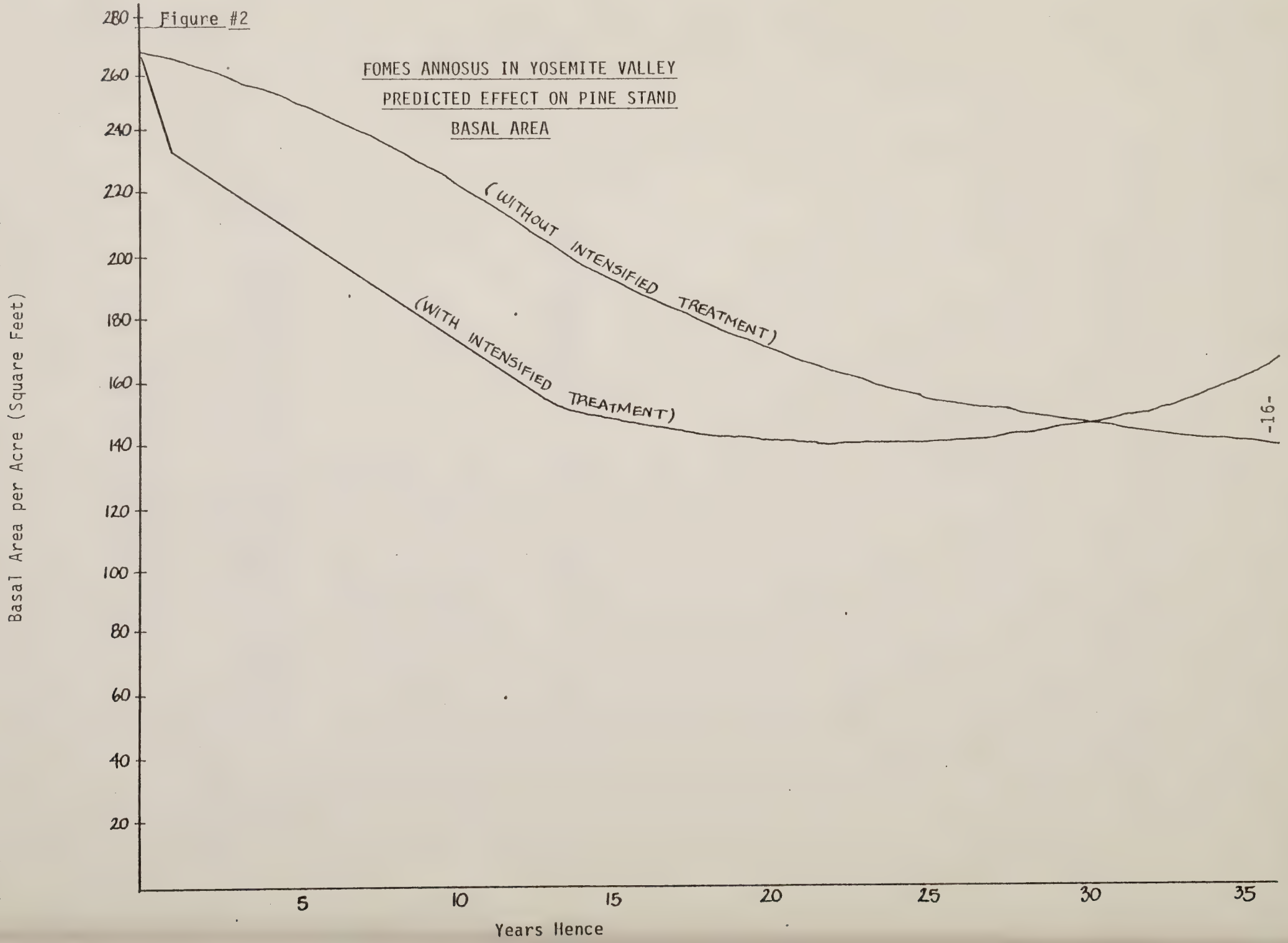
From November 1975 until October 1977, Yosemite Valley was affected by a period of drought which caused an increase in stand stress, tree decline and tree mortality. Typically there is a time lag in the adverse affects of a drought on tree stands, so stress, decline and tree mortality continue for a period of time following the end of the drought.

Drought-caused tree mortality in Yosemite Valley was harvested during 1978 and 1979 in tree salvage sales. These salvage sales reduced the average stand basal area in Yosemite Valley by nearly 30 square feet an acre.

An average of 1,100 trees per year are cut down in Yosemite National Park in the regular hazard tree removal program. This reduces the average basal area in Yosemite Valley by about 8 square feet per year.

By combining estimates of expected average stand basal areas by year from Figure 2, the expected level of recreation satisfication regarding desired stand density can be read from Figure 1.

Figure #2


FOMES ANNOSUS IN YOSEMITE VALLEY
PREDICTED EFFECT ON PINE STAND
BASAL AREA
(WITHOUT INTENSIFIED TREATMENT)
(WITH INTENSIFIED TREATMENT)
Basal Area per Acre (Square Feet)
280
260
240
220
200
180
160
140
120
100
80
60
40
20
5
10
15
20
25
30
35
Years Hence

EVALUATION OF TREE SALVAGE

Trees salvaged:[1/]

FY '79 - 2,200 trees - 25 MM Bd.Ft. - $52,000. (100% tree volume sold)

FY '80 - 2,300 trees - 26 MM Bd.Ft. - $13,000. (3 MM Bd.Ft. sold)

Costs:[1/]

FY '79 - Sale Administration = $8,000

FY '80 - Sale Administration = $8,000

FY '79 - Sale Preparation = $9,000

FY '80 - Sale Preparation = $16,000

1/ From file records of Lorne West, Forester, Yosemite National Park.

EVALUATION OF HAZARD CONTROL[1/]

Lawsuits

The types of lawsuits resulting from tree failures are:

1. Property damage.
2. Injury.
3. Fatality.

The expected value of damage occurring through the accidental failure of falling trees or limbs and resulting in successful lawsuits in any one year is:

With Intensified Treatment[2/]

1. Property damage - 13 tree failures causing property damage in 5 years = 2.6 per year.
2. Injury - 1 tree failure causing personal injury in 5 years = 0.2 per year.
3. Fatalities - There were 0 tree failures resulting in fatality in 5 years = 0.0 per year.

Without Intensified Treatment

1. Property Damage - 57 tree failures causing property damage in 8 years = 7.12 per year.
2. Injury - 7 tree failures causing injury in 8 years = 0.88 per year.
3. Fatalities - 3 tree failures causing fatality in 10 years = 0.3 per year.

1/ Information in this section is from the Recreation Tree Failure Data Base maintained by Lee Paine for the Pacific Southwest Forest & Range Experiment Station.

2/ A tree hazard removal program was initiated in Yosemite National Park in 1965. The guidelines for recognizing and rating hazard trees for symptoms of Fomes annosus root disease, provided to the Park in 1978, enabled an intensification of this on-going program.

Expected Annual Damage Awards

With Intensified Treatment[1/]

A. The expected value of damage and successful lawsuit for years 1 to 20.

1. Property damage = 2.6

2. Injury = 0.2

3. Fatality = 0.0

B. The expected value of damage and successful lawsuit for years 21 to 30.

1. Property damage = 1.3

2. Injury = 0.1

3. Fatality = 0.0

C. The expected value of damage and successful lawsuit thereafter.

1. Property damage = 0.65

2. Injury = 0.05

3. Fatality = 0.0

Without Intensified Treatment

A. The expected value of damage and successful lawsuit for years 1 to 20.

1/ According to FPM Report No. 78-2 (Citation 1), most conifers in developed recreation sites will be lost to annosus root disease within about 40 years. This will result in the loss of the forest cover or, at best, a cover of sparsely scattered hardwoods will remain. According to the authors of citation 3, this is the natural vegetation cover for Yosemite National Park.

A meadow, open woodland type of cover will reduce the probability of accidents resulting from tree failures because the number of trees in developed recreation sites will be significantly less than in well-stocked stands of high basal area.

It is assumed that in 20 years the stand density of trees will be reduced by about one half. In about thirty years the stand density is expected to be reduced by about three quarters of the present densities.

1. Property Damage = 7.12

2. Injury = 0.88

3. Fatality = 0.3

B. The expected value of damage and successful lawsuit for years 21 to 30.

1. Property damage = 3.6

2. Injury = 0.44

3. Fatality = 0.15

C. The expected value of damage and successful lawsuit thereafter.

1. Property damage = 1.8

2. Injury = 0.22

3. Fatality = 0.08

Typical Damage Awards

With Intensified Treatment

1. Property Damage = $500[1/]

2. Injury = $400[1/]

3. Fatality = $787,600[1/]

Without Intensified Treatment

1. Property Damage = $500[1/]

2. Injury = $2,300[2/]

3. Fatality = $787,600[1/]

1/ The estimates in this section are based on award cost information involving the National Park Service, Western Region, compiled by Ralph Mihan, Field Solicitor for the Department of Interior.

2/ The estimates in this section are based on publications 1 through 7 listed in the bibliography section .

The cost of the expected annual damage awards over the 40-year period are:

With Intensified Treatment

1. Property Damage

2.6 X $500 = $1,300	:years 1-20
1.3 X $500 = $650	:years 21-30
0.65 X $500 = $325	:years 31-40

2. Injury

0.2 X $400 = $80	:years 1-20
0.1 X $400 = $40	:years 21-30
0.05 X $400 = $20	:years 31-40

3. Fatality

0.0 X $767,600 = 0	:years 1-40

Without Intensified Treatment

1. Property Damage

7.12 X $500 = $3,560	:years 1-20
3.6 X $500 = $1,800	:years 21-30
1.8 X $500 = $900	:years 31-40

2. Injury

0.88 X $2,300 = $2,024	:years 1-20
0.44 X $2,300 = $1,012	:years 21-30
0.22 X $2,300 = $506	:years 31-40

3. Fatality

0.3 X $787,600 = $236,280	:years 1-20
0.15 X $787,600 = $118,140	:years 21-30
0.08 X $787,600 = $63,008	:years 31-40

COST OF FPM EVALUATION

Fiscal Year	Dollars	Present Value
1973	$10,000	$16,105
1974	10,000	14,641
1975	2,500	3,328
1976	2,500	3,025
1977	2,500	2,750
1978	2,500	2,500
1979	1,100	1,000
1988	1,000	386
1998	1,000	149
2008	1,000	57
2018	1,000	22

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No. 57:

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No. 87:

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THE GOAL OF FOREST PEST MANAGEMENT is to reduce pest-caused damage and losses on all forests and rangelands to levels commensurate with management objectives. The Forest Pest Management Staff provides leadership to forest land owners in dealing with pest problems effectively, while minimizing adverse effects on man and his environment.